QUANTUMDATA

# 802BT / 802R

VIDEO TEST GENERATORS

## 802 Series
Video Test Generators

Generate (and optionally analyze) video signals associated with the design, manufacture, and service of computer, consumer, medical, military, and other video products.

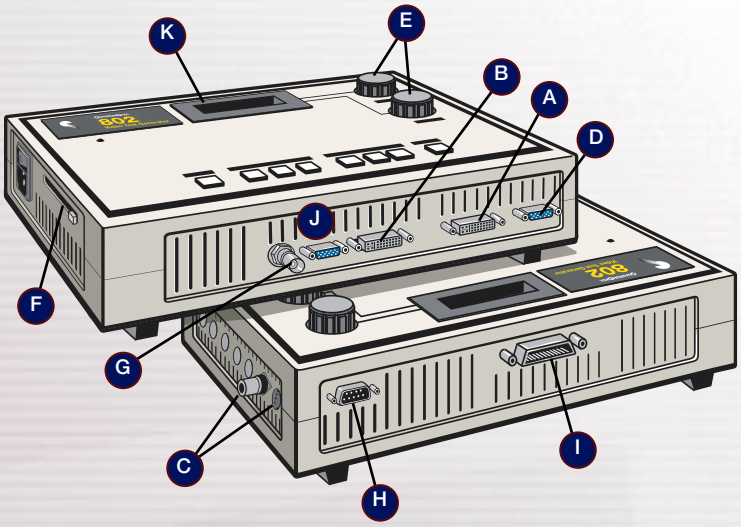
DIGITAL ANALYZER INSIDE

- All DTV Formats
- CVBS and S-Video
- DVI to 165 MHz
- HDMI™ to 81 MHz
- Component analog RGB/YPbPr to 400MHz
- LVDS OpenLDI/FPD-link to 224 MHz

**DIGITAL ANALYZERS**

DVI and HDMI (future) analyzer options are available for functionally testing video cards, set-top boxes, cabling, distribution equipment, as well as monitors and DTVs.

# QUANTUM DATA




## Features

- **A** DVI (shown), LVDS (OpenLDI/FPD-Link/QuadLDI future), or HDMI Rx (future)
- **B** DVI (shown), HDMI, or LVDS (OpenLDI/FPD-Link now, QuadLDI future) Tx.
- **C** NTSC/PAL. A TV option is available with CVBS and S-Video outputs supporting NTSC, PAL, NTSC-J, NTSC-443, PAL-60, and PAL-N.
- **D** VGA.
- **E** Two knobs allow you to alternately select format and image, test procedure sequence and step, parameter and value, or probe pixel and line.
- **F** PCMCIA slot. Clone one generator to another using a standard SRAM memory card.
- **G** Probe output provides special sync for synchronizing a light meter or triggering a scope.
- **H** RS-232 serial port.
- **I** IEEE-488 GPIB parallel port.
- **J** HDMI A/V port (modified VGA) for Rx monitoring (future) and S/PDIF digital audio I/O.
- **K** 2 X 16-line LCD.

## Signal Interfaces

Everything you need to test DTVs, computer monitors, STBs, video cards, distribution equipment, and cabling.

- Analog VGA component RGB/YPbPr output is standard with 200, 300, and 400 MHz maximum pixel rate options.
- Analog composite CVBS/S-Video output supporting NTSC, PAL, NTSC-J, NTSC-443, PAL-60, and PAL-N is optional.
- Analog video outputs are fully adjustable, self-calibrating, precise, and reliable.
- Digital DVI, HDMI, or LVDS (FPD-Link/OpenLDI) interface is optional.
- Digital DVI and HDMI interfaces can be purchased with or without optional analyzer and/or HDCP test capabilities.
- Probe output is standard for camera synchronization or precision scope triggering.

## Connectivity

- Optional IEEE-488 (GPIB) interface.
- Industry standard RS-232 serial interface.
- Video Generator Manager software. Operate generator from a Windows-based PC. Carry out all tasks including format and image choice, editing, sync control and video gating, upgrading firmware and modifying the image and format knob choices.
- PCMCIA slot accepts SRAM memory card for backup, transfer of settings from one generator to another, and storage of bitmap images for rapid recall.
- Easy firmware updates with Flash EPROMs. Update your generator using a PC and VGM™ software.

## Signal Timings

- Double-clocking option as required by EIA/CEA-861-B.
- Built-in Formats. Over 220 popular video formats are built-in including VESA, ATSC, EIA-770.x, SMPTE (170, 240, 267, 274, 293, 295, 296), EIA/CEA-861-B, NTSC, PAL, NTSC-J, NTSC-443, PAL-60, PAL-N, and Standards Australia AS 4933.1-200X.
- Format Justify. Reduces the pixel clock on formats exceeding the 802's maximum, while maintaining image centering and the original horizontal and vertical frequencies. This allows you to test medical, and other ultra-high resolution displays (4096 x 4096 and higher) without an expensive 600 MHz video generator.
- Pixel Resolution Sync. Center the display as precisely as the factory setting.

## Images

- Test Images. Over 250 built-in test images let you accurately adjust a display or projector to the same accuracy as the original factory settings. Images test color, size, linearity, convergence, focus, persistence, and more.
- Bitmap download. Download custom bitmap (.bmp) image from your PC to the USB or serial port, or load bitmaps from an SRAM card.
- 24-bit TrueColor and 8-bit index color support.
- Support for WinColorKit, Microsoft's color matching standard.
- Pixel replication test image with 1-10 range for testing EIA/CEA-861-B gaming formats.

# Specifications

## Analog Component Outputs

| | |
|---|---|
| Pixel rate | 3.9975 - 200 MHz (802BT)<br>3.9975 - 300 MHz (802R standard)<br>3.9975 - 400 MHz (802R option) |
| Increment | 0.001 Hz (infinite) |
| Color encoding | RGB, YPbPr |
| Source Z | 75 Ohms |
| Output levels | |
| Video swing | 0 to +1.000 volts (positive) |
| Sync swing | 0 to .4 volts (negative)<br>0 to .8 volts (bi-polar) |
| Setup: | 0 to 100 IRE |
| Calibration | Self-calibration with internal reference |
| Protection | Buffered with 75 Ohm isolation |
| Connector | HD 15 pin D-sub (VGA) analog RGB, Digital HS/VS, DDC |

## Data Channels

| | |
|---|---|
| DDC | DDC2B (read only) |
| DDC/CI | DDC2B+ command interface (read and write) |
| CEC | Consumer Electronics Control |

## Analog Composite TV Outputs (optional)

| | |
|---|---|
| Sample rate | 24.55 - 29.50 MHz |
| Pixel rate | 12.27 - 14.75 MHz |
| Source Z | 75 Ohm |
| Calibration | Self-calibration with internal reference |
| Connectors | BNC, MiniDIN-4 |

## DTV and Digital Video Outputs (optional)

| | |
|---|---|
| DVI signal | DVI 1.0, TMDS |
| Color encoding | RBG or YCbCr 4:4:4 |
| Pixel rate | Single link 25 - 165 MHz |
| HDCP | HDCP 1.1 |
| Key options | No key (standard)<br>Production key (optional) |
| Test modes | Manual step mode, automatic, sequential, or dedicated pass/fail |
| HDMI signal | HDMI 1.0, TMDS (optional) |
| Color encoding | RGB or YCbCr 4:2:2 |
| Pixel rate | 25 to 81 MHz |
| LVDS Signal | FPD-Link, OpenLDI 0.95 (optional) |
| Single link | 32.5 - 112 MHz |
| Dual link | 112 - 224 MHz (optional) |
| Connector | MDR-36 |

## Video Memory

| | |
|---|---|
| Configuration | 4096 x 4096 x 8-bit indexed color |

## Color Depth

24-bit to 100 MHz for 802R-400 (82.5 MHz for 802BT or 802R-300)

8-bit up to 200, 300, or 400 MHz

## Probe Tool

Position a pulse anywhere in the video frame. Useful as an extremely low jitter scope trigger or inspection camera trigger.

## Test Images

| | |
|---|---|
| Standard | 150 computer and broadcast |
| User-defined | Up to 400 additional images |
| Edit method | PC using VGM™ software |

## Test Sequences

| | |
|---|---|
| Storage | 2000 steps |
| Edit method | PC using VGM™ software |
| Parameters | |
| Select | Format, image, version, sync, gating on/off |
| Time | 1 sec. to 24 hours, or # of frames |

## Vertical Timing

| | |
|---|---|
| Frequency | 1 Hz - 650 Hz |
| Vertical active | 1 to 4094 lines progressive<br>2 to 8190 lines interlace |
| Vertical total | 2 to 4095 lines progressive<br>5 to 8193 lines interlace |
| Sync pulse width/delay | 0 to 4095 lines |
| Sync types | |
| ACS | Analog Composite Sync<br>Sync on any/all channels (RGB)<br>Bi-Level or tri-level |
| DSS | Digital Separate Sync |
| DCS | Digital Composite Sync |
| Frame sync | Available for ATE camera lock |
| Equalization and serrations | Selectable |

## Horizontal Timing

| | |
|---|---|
| Frequency | 2.29 KHz to 1 MHz |
| Total pixels | 144 to 65,535 total |
| Active pixels | 16 to 4096 |
| Sync pulse width | 1 to 65,519 pixels |
| Sync delay (front porch) | 1 to 65,519 pixels |

## Video Formats

| | |
|---|---|
| Standard: | Over 220 composite and component formats for computer (VESA), display manufacturers ((including Apple, Sun, HP, ViewSonic, Sony, IBM, Barco), medical (including Dome and DataRay), military (including HOBO, STANAG, MAVERIK, LMC), TV, and more. |
| User defined | Up to 1000 additional formats |
| Television | SDTV, HDTV, DTV formats |
| Resolutions | 240, 288, 480, 540, 576, 720, 1080, 1152 |
| Scan types | Interlaced, progressive, segmented frame |
| Clocking | 1x or 2x |
| Aperatures | Natural, letterbox, anamorphic, widescreen, safe-title |
| Frame rates | 24, 25, 30, 50, 60, 75, 85, 90 |
| NTSC tuning option | 1/1.001 |
| Pixel aspects | Square 1:1, 8:9, 16:15, 32:27, 64:45 |
| Gamuts | 0-255 full or 16-235 RGBY, 16-240 CbCr limited |
| Sampling | 4:4:4 or 4:2:2 |
| Composite | NTSC, NTSC-J, NTSC-443, PAL-60, PAL, PAL-N |
| Edit method | PC using VGM software or ASCII commands via HyperTerminal |

## HDMI™ Output

| | |
|---|---|
| Video | |
| TMDS protocols | DVI and HDMI 1.0 |
| Pixel rate | 25 to 81 MHz |
| Video signal types | RGB or YCbCr |
| Sampling modes | 4:4:4 or 4:2:2 |
| Bits per component | 8, 10, or 12 |
| Pixel depths | 8-bit Indexed or 24-bit TrueColor |
| Clock per pixel: | 1 or 2 |
| Pixel repetition: | 1 to 10 via test image |
| Quantization modes | Full w/optional gamma correction |
| Colorimetry | ITU-R BT.709-5 Part 1, Sec 6.10<br>SMPTE 296M Sec 7.12 under/overshoot<br>Legacy HDTV SMPTE 260M-1999 Table 1<br>ITU-R BT.601-5 Sec 3.5.1<br>ITU-R BT.709-5 Sec 4.2-1125 |
| Content fitting methods: | All AFD cases, Shoot & Protect, Overscan, Underscan, Letterbox/Pillarbox, Anamorphic Squeeze |
| Aspect ratios | |
| Content | 4:3, 14:9, 16:9 |
| Embedded | 4:3, 16:9 |
| Format (coded) | 4:3, 16:9 |
| Format timings | All 94 EIA/CEA-861-B formats<br>All E-EDID sink-requested < 81MHz |
| Data (Island) Packet Generator | |
| Types | HDMI Control Packet, audio samples, ACR, InfoFrames |
| CP Schedule | Never, once, every frame |
| Configuration | Automatic or manual |
| Max payload | >255 bytes/frame |
| Error protection | BCH |
| InfoFrame Generator: | |
| Types | AVI, SPD, AUD, MPG, GIF (generic) |
| Scheduling | Never, once, every frame |
| Configuration | Automatic or manual |
| Pseudo-Noise Generator | Adjustable - QDI-BCM noise algorithm |
| Connector | HDMI Type A |
| Links | Single |
| Audio | |
| Streams | 1 |
| Channels | 2 |
| Bits per sample | 16 |
| Sampling rates | 32.0, 44.1, 48 KHz |
| Stream type | IEC 60958-3 Consumer LPCM |
| Audio content | FL and FR |
| Embedded sonic data generator | |
| Channels | 2 |
| Waveform | Sinewave |
| Amplitude | -96.3 to 0.0 dBFS |
| Frequency range | 20-to-20KHz |
| Controls | Mute, amplitude, frequency |
| External audio interface | |
| Type | SP/DIF input |
| Amplitude | As received |
| Mixer | Mux: Sinewave or external audio |
| Connector | 2nd VGA w/special SPDIF I/O |
| Cable | 75-ohm special VGA-to-RCA |
| DDC | Reads sink's E-EDID version 1.3 |
| CEC | Hardware present |
| HPD | Hardware present, integrated with HDCP |
| Power | +5V |
| HDCP | Production key optional |

## Front Panel Interface

16 x 2 character LCD

Format and Image selector knobs

Invert, video gate, sync gate, output on/off buttons

## USB Interface

Download bitmap (.bmp) image files

## PCMCIA Port

| | |
|---|---|
| Description | Backup settings, transfer settings from one generator to another, and storage of bitmap images for rapid recall using a standard SRAM card. |

## Computer Interfaces

Control generator using ASCII commands over the RS-232 or GPIB ports, or with Windows-based Video Generator Manager program.

| | |
|---|---|
| Video Generator Manager software | |
| File editing | Create, edit and organize your custom format, image and sequence files |
| Bitmaps | Download .bmp files |
| Firmware | Install firmware upgrades |
| Archive | Preserve custom data when upgrading firmware or hardware |
| Knob lists | Specify which formats and images are visible on the front panel |
| RS-232C Interface | |
| Port settings | 300-115,200 bps; 8 data bits; 1 or 2 stop bits; none, odd, or even parity; one or RTS/CTS handshake |
| Connector | 9 pin D-Sub receptacle |
| IEEE-488 Interface (optional) | |
| Protocol | IEEE-488.2 |
| Connector | 24 position Micro Ribbon |

## Miscellaneous

| | |
|---|---|
| AC Mains | |
| Frequency | 50 to 60 Hz |
| Voltage | 100-240 VAC |
| Current | 0.5 A |
| Weight / Size | |
| Unpacked | 7 lb (3.2 kg) / 3.8 x 7.7 x 12.2 in |
| Shipping | 12 lb (4.1 kg) / 7 x 11.5 x 17 in |

Specifications are based on 802BT firmware 7.483150000, and are subject to change without notice. HDMI, the HDMI logo and High-Definition Multimedia Interface are trademarks or registered trademarks of HDMI Licensing LLC.

## Analyzer Option

### Overview

A new derivative of the 802 video signal generator (known as a signal analyzer) is now available with two digital connectors. In addition to the transmitter connector, which emulates various hosts, a receiver connector has been added that allows a high quality display to be emulated as well. Now, inbound video (from either the generator itself or an external source) can be analyzed for data errors and timing anomalies. Results can be displayed on the front panel or sent to an external computer via serial or GPIB for logging purposes.

Video card and set-top-box manufacturers will find this instrument invaluable for verifying signal quality, timing, and color encoding. A host's digital video interface can now be rigorously tested without meticulous inspection of a monitor screen. A pseudo-random noise (PN) rendering application program or data file (provided) can be used to fill the video card's frame buffer with a sequence of highly dynamic pixel values. With the resultant video signal connected to the input of the analyzer, signal quality can be measured blindly and test results delivered in simple numeric terms. In cases where the video source cannot support the rendering of pseudo-random noise data, a "delta error" measurement technique can be alternately used, which counts flickering pixels in still-frame test images. Timing can measured without regard to video content.

The instrument is also excellent for finding problems with cables, cable extenders, and distribution systems. Everything needed to test transmission systems from end-to-end (using pseudo-random noise) is now available in a single instrument.

### Signal Generator

**Noise Type Generated:** QDI-BCM **HDCP:** No key (standard) or production key (option) **DDC:** Enhanced DDC, DDC/CI
**Special Images:** FormatRx, DeltaErr, PRN_5, PRN_9

### Quantum Data-Broadcom (QDI-BCM) Pseudo-Random Noise

**Sequence Length:** Manual: 4 to (2^31-1) pixels, Auto: hActive*vActive **Bit-to-Bit Correlation:** None **Noise Value Advance:** Manual: Every pixel or active pixels only, Auto: Active pixels only
**Sequence Repeat:** Continuous or stop after n=1 to 4,294,967,295 sequences **Seed Value:** Manual: 0x00000001 to 0x7FFFFFFF, Auto: 0x08000001 **Re-seed Logic:** Via magic pixel value
**Re-seed Period:** Manual: 3 to 2,147,483,647 pixels, Auto: hActive*vActive

### Signal Analyzer

**Measurements:** Pixel rate, fields-per-frame, H & V rate, total, active, sync delay, sync width, sync polarity, H to V sync alignment **Machine Unit Accuracy:** Zero tolerance
**Frequency Accuracy:** < 0.3% **Noise Type Accepted:** QDI-BCM **Error Tallies:** Chan0Err, Chan1Err, Chan2Err, PixelErr, DeltaErr **Error Tally Range:** 0 to 4095 **PN Error Memory:** 1 expected and 1 measured 24-bit value **Pixel Data Analyzer:** 1024 square pixels (for measuring pixel values and detecting flickering pixels) **HDCP:** Production Key (B1 special order) **EDID:** Emulates a high-definition display (reprogrammable) **Calibration:** Pattern with known number of errors (PRN_5 or PRN_9)

### Signal Analyzer Manager (SAM) Application Program

**Routines:** Timing measurement, noise measurement, and color bar value analysis **Test Targets:** Video cards, set-top-boxes, players, distribution equipment, and cabling
**Requirements:** Windows-PC (with Microsoft DirectX), and serially-connected signal analyzer. **Test Automation:** Full or semi via spreadsheet interface. **Reports Generated:** Tab-delimited text files, which can be imported to MS-Excel and other applications

## DVI Analyzer

### Transmitter

**Physical Chip:** Sil170B (single-link) or Sil168 (single or dual-link)

### Receiver

**Physical Chip:** Sil169 (single or dual-link)

## HDMI Analyzer

Available 2004

### Transmitter

**Physical chip:** Sil9190 **Links:** Single **CEC:** Consumer Electronics Control
**Audio:** Z-Ch L-PCM programmable sinewave (frequency and amplitude) at 32, 44.1, and 48 kHz.

### Receiver

**Physical chip:** Sil9993 **Links:** Single

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